Six Syllabi from the Early Years of American Geological Education, 1817-1838

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ABSTRACT

Between 1817 and 1838 professors at the University of Pennsylvania, South Carolina College, Yale College, and Columbia College published six syllabi for earth science courses. All stressed geology. These syllabi give unique insight into classrooms of almost 200 years ago. The greatest difference between the six syllabi involved historical geology. Some pioneer professors viewed observation as the only basis for interpreting geological history. Others viewed Biblical revelation as the dominant, or at least an important, guide to deciphering the history of Planet Earth. Eventually differing approaches to historical interpretation led to a well-documented religion-geology confrontation. It culminated in a much-publicized attempt to impeach a college president who taught an observation-based geology course. After 1832, the year of this failed impeachment, known syllabi continued to emphasize observation. By 1834 the once exonerated college president and his entire faculty were fired. By 1840 research in the Alps showed that widely distributed high altitude earth-surface sediments of mixed clastic character, generally called the Drift, are of glacial origin. This observation-based view was gradually accepted by much of the scientific community. Before 1840 some earth science teachers saw all occurrences of the Drift as clear proof that the Flood of Noah covered the entire planet, including the highest mountains. The Drift and the Noachian Flood were major themes in some science classrooms. Today, the Drift is less controversial. Evolution is the new battleground but the conflict is the same. It is an impasse between the interpretation of Biblical revelation and the interpretation of observation.

INTRODUCTION

In thinking about classroom instruction in 1838 and earlier years, it is important to remember that many basic concepts of modern geology had yet to evolve. For example, a standard bibliography of early American geology (Hazen and Hazen, 1980, p. 402-404) suggests that before 1840 no contributor to an American periodical clearly discussed either organic evolution or continental glaciation. While geologic education has changed since the 1830s, the function and the course offerings of colleges changed even more. Harvard was the first viable American college. When Harvard began, its primary function was the preparation of a literate clergy (Morison, 1936, p. 247). Rudolph (1977) briefly traces the diversification of college curricula from the earliest days through the middle twentieth century. For roughly the same time period, Cremin (1970, 1980) provides details of the history of American education at all levels. For much of the nineteenth century Bible and classical languages remained dominant themes even in schools that were at least partially supported by public funds. In the earliest days, before 1801, virtually all college presidents were ordained men, as were many or most professors (Carrell, 1968a; 1968b). A powerful religious imprint, rooted in history, was eventually strengthened by off-campus activities. In 1815, The American Society for the Education of Pious Youth for the Gospel Ministry began. It soon became the largest of several evangelical groups funding college students who planned ministerial careers. Primarily a Presbyterian and Congregationalist venture, by the 1830s this society directly supported about 10% of American college students (Naylor, 1984). It funded more than 20% of students in some schools. The society controlled curricula. It could respond to proposed changes in course offerings by withholding funding and virtually destroy a school. That happened. On all campuses the Society only supported students of approved Christian denominations. Catholics, Unitarians, and Universalists were always excluded. Other Protestant denominations could be excluded if their financial support of the Society was inadequate. Like the American Society, other evangelical groups supported students and could impact curricula. When a few early college professors began teaching geology they were a new element on campuses where religious studies were deeply ingrained.

In 1816 Thomas Cooper (Figure 1), joined the collegiate faculty of the University of Pennsylvania (Greene and Burke, 1978, p. 34). In 1817 he published a prospectus on an earth science course he planned to teach (Cooper, 1817). Soon Cooper offered a more detailed syllabus (Cooper, 1818). By 1818 he had taught this course in the Fall of 1817 and in the Spring of 1818. Thus his

FIGURE 1. Thomas Cooper

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printed words were seasoned by life in the classroom. Cooper's syllabi established a new genre of American geological literature. Similar publications by Cooper and by others followed. An online search of Library of Congress call numbers for known syllabi, supplemented by study of standard bibliographies of geology, suggests that a total of six were published. Syllabi served students and were advertisements for courses but they played another role. They appeared at a time when geology was slowly emerging as a common subject of instruction. Thus early syllabi could also serve as models for novice teachers in other schools. Later, text books appeared that were ostensibly written for one school but served national or regional book markets (e.g.: Hitchcock, 1840; Mitchell, 1842). They essentially replace published syllabi that circulated both on and off campus. The first generation of geological syllabi, reviewed below, and brief biographies of pioneer professors, offer insight into what was taught in geology classrooms in some early 19th century American colleges.

THOMAS COOPER: THE UNIVERSITY OF PENNSYLVANIA, 1817-1818, AND SOUTH CAROLINA COLLEGE, 1821

English by birth, Thomas Cooper (1759-1839) was educated at Oxford but did not receive a degree. A child of wealth, he practiced law briefly in Great Britain and was part owner of a firm that printed calico cloth. He knew many British geologists and their work, but he did not contribute to the development of geology in Great Britain. In his native land he was more famous for political agitation than science. Sympathetic to the French Revolution, he traveled to France and met Robespierre. He also wrote against the profitable British slave trade and against organized religion with its salaried clergy. When Cooper's calico firm failed in 1795, he immigrated to the United States.

In America, Cooper became a criminal by deliberately violating the Alien and Sedition Law, which limited criticism of public officials. He criticized President Adams, was imprisoned for six months, and fined $800. Still his intellectual vigor was admired by prominent people, including the newly elected president of the United States, Thomas Jefferson. Within four years of his imprisonment he became a federal judge in Pennsylvania. Jefferson tried to gain Cooper an academic appointment at the new University of Virginia but he was unsuccessful mainly due to opposition from the religious community. His lack of a college degree did not limit his suitability for a role in higher education since many early professors were not college graduates (Carrell, 1968a).

Cooper taught science at Carlisle (later Dickinson) College (1811-1815), and at the University of Pennsylvania (1816-1818). In his last year at the University of Pennsylvania, the extended title of one publication identified him as "Professor of Geology and Mineralogy" (Cooper, 1818). In Cooper's era geology was rarely offered. It seems clear that he was the first American with "geology" in his formal academic title.

His initial appointment at South Carolina College, made in December, 1819, was as Professor of Mineralogy and Chemistry (LaBorde, 1859, p. 102). In April 1820 he resumed his former title as Professor of Geology and

Table 1[1] COOPER'S FIRST SYLLABUS: A COURSE OF MINERALOGY AT THE UNIVERSITY OF PENNSYLVANIA, 1817

"The following advertisement is taken from the daily gazettes, and will give our readers a general view of the topics which will be discussed by the learned Professor. Ed.

The undersigned proposes to give a course of mineralogy at the university in Ninth-street, to commence the middle of November; the lectures to continue three times a week, until the course is completed, which is expected to occupy ten or twelve weeks. The following is an outline of the plan proposed to be pursued:

1. Introductory
2. On the globe of the earth. On the general characters of minerals, specific gravity, hardness, fracture, crystallization, phosphorescence, etc.
3. On the rocks termed PRIMITIVE, and their component parts.
4. On the substance found in primitive rocks so called.
5. On the rocks termed TRANSITION, and their component parts.
6. On the substances found in the transition rocks, so called.
7. On the rocks termed SECONDARY, and their component parts.
8. On the substances found in secondary rocks, so called.
9. On VOLCANIC formations, or Lavas.
10. On ALLUVIAL Deposits.
12. On BASINS: On the great Mississippi Basin: on the Basin at Richmond, Virginia: On the Paris Basin: On the London Basin: On the Isle of Wight Basin.
13. On Organic Remains.
14. On Geological Theories.

The course will be illustrated by a very extensive Mineralogical collection.

Thomas Cooper, M.D."

[1]This is a complete verbatim copy of the original printed in the Port Folio (1817, p. 497-498).

Mineralogy (LaBorde, 1859, p. 103). Soon the presidency of the college became vacant and Cooper was chosen as President *pro tempore*. On December 1, 1821 he was confirmed as president (LaBorde. 1859, p. 129-130). On December 3, 1822 Cooper and the Board hired Lardner Vanuxem as Professor of Geology and Mineralogy, with a requirement to teach chemistry. At the same time the Board asked the legislature to appropriate $3,000 to purchase Cooper's mineral collection for use by the College (LaBorde, 1859, p. 128). Vanuxem was a Pennsylvanian who studied geology in France (Millbrooke, 1982, p. 26-28; Anonymous, 1848; Smith, 1968). He left the college in 1827. It is uncertain that Vanuxem replaced Cooper in every geology class. Cooper's known involvement in American geology began by 1812. He published at least twenty-four items in the earth sciences (Hazen and Hazen, 1980, p. 123-124). Malone (1926), Kelley (1930), and Cohen (1999) provide biographical details.

Initially Cooper rooted his lectures and his syllabi in "the first … 'modern' geology text in English" (Torrens, 1995, p. 33). Written by Robert Bakewell, the first edition (Bakewell, 1813) and all later British imprints stressed "practical and applied geology." Mineralogy was a minor subject within a geological framework. In his first syllabus Cooper called his prospective course "Mineralogy," perhaps because mineralogy was the traditional title of a University of Pennsylvania earth science course. This school had a discontinuous history of earth science education beginning in 1756. Rev. William Smith was the first instructor (Corgan, 1987, p. 188-189). He made no known contribution to geology outside of his classroom.

When Cooper began at Pennsylvania he planned a new and distinctive course (Cooper, 1817, p. 498):

> "The mode of teaching mineralogy that I have chosen to adopt is to make it consequent upon and secondary to geology."

Cooper's emphasis on geology rather than mineralogy contrasted with the approach of the first known American book designed for collegiate level earth science teaching (Cleaveland, 1816). In that book an initial block of 585 pages of mineralogy was followed by only forty four pages of geology (Cleaveland, 1816). At about the time Cleaveland's book appeared an American printing of another British geoscience text entered the book market (Phillips, 1816). Called "An Outline of Mineralogy and Geology," it was structured like Cleaveland's volume. While these books were used where mineralogy was emphasized, all geological syllabi reviewed here followed the pattern of Bakewell's text. In addition all but one resembled Bakewell's work in another way. Perhaps because he was a Unitarian (Torrens, 1983, p. 129), Bakewell wrote without extensive references to Christian scripture.

Cooper authored two syllabi for his course at Pennsylvania. The first, just 25 lines long, originated as a newspaper advertisement for a proposed course. It also appeared in *Port Folio*, a journal that once employed Cooper (Kelley, 1930, p. 58). Table 1 is a verbatim copy. Cooper's second syllabus, abridged in Table 2, was four terse pages (Cooper, 1818). It offered an introduction and outlined the course. Topics were listed without hierarchy as separate lines and brief paragraphs. Although his newspaper prospectus (Cooper, 1817) called the course "Mineralogy," it was not named in 1818. Three years later, while President of South Carolina College, he published a new syllabus, six pages long (Cooper, 1821). In structure and coverage it resembled his earlier effort. This time he called his course "Elements of Geological Mineralogy." Like later syllabi it is too long to reproduce in full. Table 3 is an abstract. In all his classes, Cooper used specimens in instruction. His writing suggests that he demonstrated instruments. His treatment of physical aspects of geology is explicit. Syllabi also suggest that it was detailed. His thoughts on earth history are implicit in the study of a sequence of rocks that formed in an orderly, natural way through time.

BENJAMIN SILLIMAN AND HIS SYLLABUS: YALE COLLEGE, 1829

Born in Connecticut to a prominent family, Benjamin Silliman (1779-1864: Figure 2) entered Yale College in 1792 when he was 13. He was not unusually young for a freshman (Mohsenin, 1983). The president of Yale, Ezra Stiles (1727-1795), was a master of Semitic languages and a Congregational minister (Hall, 2003, p. 343-344; Morgan, 1999, p. 771-772). Stiles taught theology, languages, and related subjects, but he had a personal involvement with science. He made weather observations and was interested in astronomy. In 1794, while Silliman was still a student, Stiles was aided by professor Josiah Meigs (1757-1822), another Congregational minister and a mathematician. He had an interest in natural philosophy (Reynolds, 1999). During the Stiles era, modern science was not in the Yale curriculum but it was in the general ambiance of the school.

When Silliman graduated in 1796, Dr. Timothy Dwight (1752-1817) was President. Dwight was another Congregational minister, brilliant, orthodox, and active politically (Hall, 2003, 109-110; Downing, 1999). When Dwight assumed the presidency, in 1795, Yale had never offered the natural sciences or chemistry. In 1802 Dwight chose Benjamin Silliman, his unusually religious pupil, to

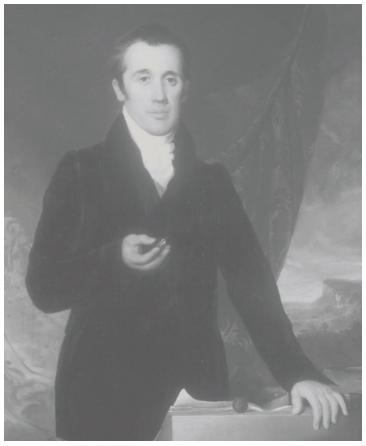


FIGURE 2. Benjamin Silliman

return to Yale as the school's first Professor of Chemistry and Natural Science. In earlier years Silliman had no demonstrated interest in science. Before offering science courses, he invested four years studying in America and Europe. For easily accessed biographies of Silliman see Fulton and Thompson (1947), Greene (1979), and Warren (1999).

Back at Yale, Silliman spent considerable energy reconciling human observation with Biblical revelation. In 1829 he edited Bakewell's English geology text for use in the United States by adding an addendum that introduced Biblical themes into a text that essentially lacked religious content (Bakewell, 1829). The addendum, which was also published separately (Silliman, 1829), was the syllabus for a course where Silliman blended religion and geology. Bakewell's British stratigraphic and geographic terminology remained untouched. The conceptual content of syllabi by other authors is easily parsed into subjects such as Mineralogy and Volcanic Phenomena. At 128 pages, Silliman's syllabus defies simple analysis. It is roughly categorized in Table 4. For a college student of any era it might be hard to decipher. The Preface (p. 3-7), for example, assumes prior familiarity with the work of prominent geologists, such as the German theoretician Werner (Sargeant, 1980, p. 2402) and the Anglo-American observer Maclure (Sargeant, 1980, p. 1632). It also uses terms, such as "igneous," without an initial definition. In later portions of the text European scholars and geographic regions of the world are named often without detailed identification. This syllabus never discussed the nitty-gritty of examining and characterizing minerals, rocks, or fossils. It stayed above the level of dirty finger nails. And, it often ties geology to Biblical revelation. For example the Preface (p. 7) says:

> "…discoveries of geology (are) consistent with … Book of Genesis…"

The first major unit of the text (p. 9-24), an Introduction, deals with places where rock can be observed. The next unit (p. 25-67) is a summary of earth history following the speculative interpretation of Werner. In this theory the oldest rocks, called the Primitive, are primarily granites. They are viewed as aqueous deposits. Wernerian Theory continues with the Transition and other units, resembling Cooper's earlier syllabi (Tables 1-3).

The most distinctive portion of Silliman's syllabus

Table 2[1] COOPER'S SECOND SYLLABUS - THE UNIVERSITY OF PENNSYLVANIA, 1818

"FOR THE PORT FOLIO

Syllabus of the Lectures of Thomas Cooper, Esq. M.D. as Professor of Geology and Mineralogy in the University of Pennsylvania

Of the characters of mineral substances, ...
Of the means of distinguishing mineral substances artificially: . . .
Of the specific gravity of the globe of the earth, ...
Of the crust of the globe as far as we have yet pierced into it.
Of mineral classification: . . . .
Of the foundation of geological science, viz. regularity of position of the formations and strata . . . .
Causes of anomaly and exception: viz. volcanic action; action of water. . . .
Of the division of the formations into primitive, transition, secondary, alluvial, and volcanic. . . .
Of the PRIMITIVE formations, viz. granitic, ...
Of the TRANSITION rocks: of porphyry: of clay slate . . . .
Of the SECONDARY, floetz, or horizontal formations . . . .
Of the ALLUVIAL SOIL and the organic remains found in it . . . .
Of VOLCANIC formations: viz. of modern and active volcanoes . . . .
Of BASINS: 1. Of coal basins . . . . Of chalk basins . . . . Of the great basin of the Mississippi.
Of MINERAL WATERS: 1. Saline, ... 4. Thermal.
Of METALLIC SUBSTANCES in veins, beds, or strata: . . . .
Of METEOROLITES and falling stars.
Of theories and COSMOGENIES; and the insufficiency of any yet proposed taken singly, to account for known appearances.

. . . . I insert the preceding syllabus of my lectures, as containing new arraingement at least; and as suggesting views of the subject not to be found in the usual systems of mineralogy. – T. C."

TOPICS AND PERCENTAGES INTERPRETED BY THE PRESENT AUTHORS

Mineral properties and classification	15%
Wernerian stratigraphy (Primary, Transition, Secondary, Alluvial)	55%
Minor topics	30%
volcanoes and basins,	
mineral waters,	
metals and meteorites	
insufficiencies of cosmogonies yet proposed.	

[1]After Cooper (1818, p. 3-8). The percentage of class time devoted to each topic is estimated to roughly equal the amount of the syllabus devoted to that topic.

concerns the Noachian Deluge (p. 68-96). He devoted 22% of a geological syllabus to a concept that is Biblical. The cause of the Deluge was the "will of the Deity" (p. 68). Silliman felt it was safe to "… take for granted the Mosaic account is true…" (p. 74). He then focused on the source of water for the Flood. He discusses earlier speculation that oceanic water supplemented rain. Silliman calculated the rate of rise of water that would cover mountains 5.5 miles high in 40 days. He estimated it at 726 feet per day (Silliman, 1829, p. 76). That is 30.25 inches per hour, for forty days and nights all over the earth. To seek possible sources for this water Silliman evaluated concepts of the continents sinking into solid earth which some had suggested saying (Silliman, 1829, p. 75):

> "We are of course led to enquire whether there was a general cavity beneath the entire crust of the planet…"

While Silliman's reasoning was innovative, it resembled the seventeenth century work of the Rector of Warrington in Suffolk, England. The Rector wrote *Geologia*, a book defending the scriptural interpretation of earth history (Warren, 1690). Silliman also could be "old school" in dealing with thoughts rooted in the observation of physical processes. For example (Silliman, 1829, p. 15):

> "Although it cannot be supposed the rivers have *generally* formed their own beds, there can be no doubt that these currents of water do *often* increase in depth and alter the form of their channels" (The present author's italics).

This suggests that, in 1829, Silliman viewed Planet Earth as stable from the time of creation; that rivers were always much as they are now.

The last unit of Silliman's text concerns volcanoes (p. 98-119). Between 1826 and 1828, Silliman reviewed or wrote introductions for five volcano-related volumes (Hazen and Hazen, 1980, p. 343). He blended this mass of information with older studies to supplement Bakewell's text. This discussion ended with thoughts on the origin of the elements, concluding that the process that created the elements was a "revelation withheld by the Creator" (p. 115). Later he offered another hypothesis (p. 117), on a scale comparable to his thoughts on the Flood. It involved hypothetical physical processes but were not based on observation. He felt that both volcanism and seismic activity might be caused by air and water or saline and acid fluids penetrating to great depth in the earth where there might be flammable material of unstated nature and origin. The Summary (p. 120-126) begins with "In the beginning, God created the heavens and the earth …." (p. 120). The Conclusion (p. 126) affirms that "… there is no real inconsistency between the Mosaic history and the actual structure of the earth."

Table 4 is an approximate evaluation of the content of Silliman's syllabus. He went on to publish two other addenda, accompanying later editions of Bakewell (1833;

Table 3[1] COOPER'S THIRD SYLLABUS IN SOUTH CAROLINA COLLEGE, 1821 - "SYLLABUS OF A COURSE OF LECTURES ON THE ELEMENTS OF GEOLOGICAL MINERALOGY; ILLUSTRATED BY NUMEROUS SPECIMENS OF ROCK MASSES: AND OF MINERALS AND ORES, IMBEDDED IN THE ROCKS. . . ."

PHYSICAL GEOGRAPHY	
"Of the globe of the Earth: its figure: density, &c."	2%
"Of seas, continents, mountains, vallies: of islands…."	1%
"Of the abrasion and decomposition of the strata…."	2%
"Of the temperature of the atmosphere, of the sea,…"	1%
ROCKS AND MINERALS	
"Of the artificial distribution of the rock masses…"	3%
"Of rocks stratified and unstratified,…"	2%
"Of minerals composing, and contained in, rocks: the methods of ascertaining them…."	4%
"Of the Goniometer,…blowpipe;….balance, microscope…, knife…"	2%
FORMATIONS	
"Of the formations called PRIMITIVE…" [igneous & metamorphic]	26%
"Of the formations called TRANSITION OR INTERMEDIATE…." [Grauwacke & low grade metamorphic]	9%
"Of the formations called SECONDARY." [Paleozoic & Mesozoic]	12%
"Of the local formations called TERTIARY" [includes Cretaceous]	4%
"Of the formations called ALLUVIAL, (transported masses and strata.)" [includes Diluvium]	8%
"Of VOLCANIC formations"	21%
"Of **METALLIC** Minerals in beds, nodular masses, … formation of veins, …"	1%
"Of **METEOROLITES**"	1%
"Of **GEOLOGICAL THEORIES**	1%

[1]Words in quotes are by Cooper (1821). Three of the headings, percentages, and items in brackets are by the present authors. Percentage assumption is the same as Table 2.

Table 4. AN APPROXIMATE CONCEPTUAL EVALUATION OF SILLIMAN'S SYLLABUS, 1829	
Theoretical	6%
Religion (including the Flood)	33%
Physical Geology	10%
Historical Geology	31%
Volcanology	20%

1839). They were also printed separately (Silliman, 1833, 1839). Like the first addendum they were strongly Bible-based. In the last addendum Silliman said (*In* Bakewell, 1839, p. 462):

> "The outline of my lectures annexed to the … edition of 1829 does not present a correct view of the course which I now give."

He went on to correct a variety of details but his blend of revelation and observation was unaffected by the passage of time.

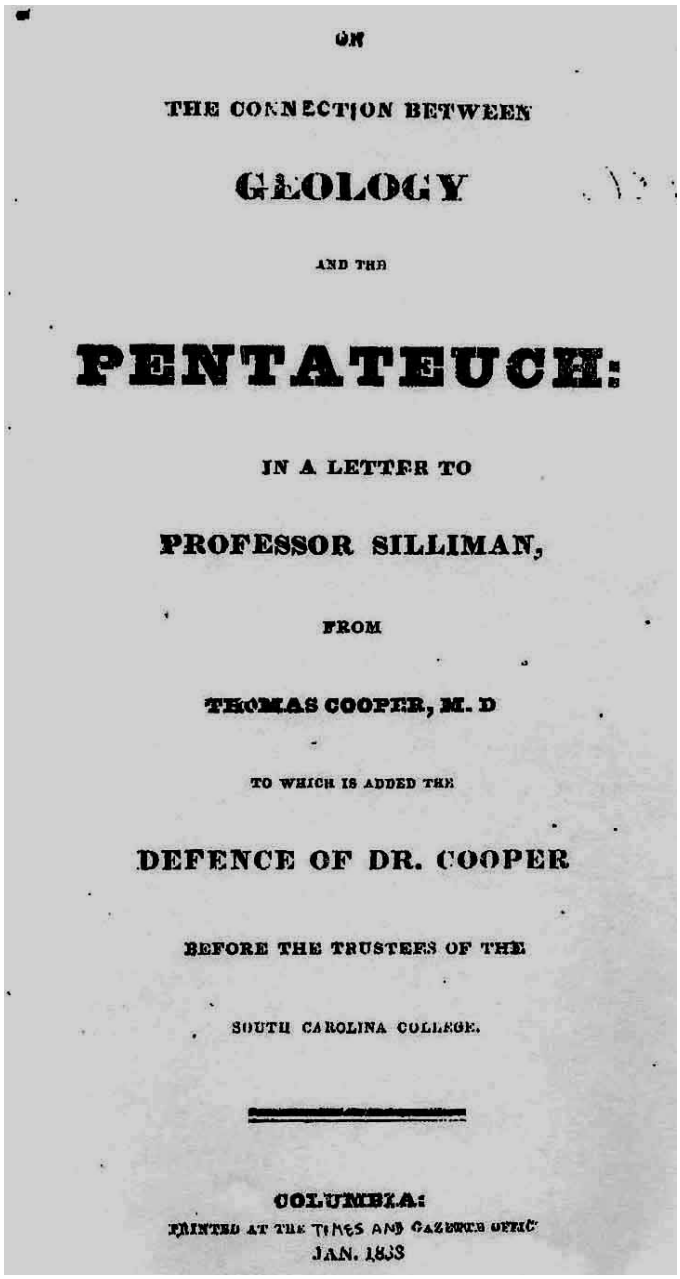
As an editor, author and professor at Yale, Silliman became a dominant figure in American geology. He was one of a group of pioneers, largely reared in Puritan New England, whose deep roots in Biblical revelation guided geological interpretation. For example, a recent review of early geology textbooks that served secondary schools and were published in the United States (Corgan and Stearns, 2008) shows that the earliest were written by New Englanders: Browne (1832), Mather (1833; 1838), and Comstock (1834, 1836). To cite one example of Bible-based interpretation, each author just named viewed superficial clastic deposits, called the Drift, as sediments of the Noachian Flood. Then Hitchcock (1841), with help from Silliman, translated portions of a French-language report on the Alps. Written by the esteemed Louis Agassiz (1840), it interpreted the Drift in glaciated areas as a result of glacial action. Gradually many geologists came to view all occurrences of Drift as evidence of glaciation rather than as a residue from the Flood. In Ohio, for example, 1857 was the date of the first publication that clearly identified widespread deposits of Drift as glacial sediments. This breakthrough came in a secondary school geology text by Samuel St. John (1857). White (1967) and Corgan and Stearns (2008) discuss St. John and his work.

COOPER VS. SILLIMAN

In South Carolina, after 1829, Cooper continued to teach geology but could no longer get British editions of Bakewell's text. He chose to adopt Silliman's American edition with its lengthy religious addendum (Bakewell, 1829; Silliman, 1829). To the chagrin of some South Carolina clergy, whom Cooper (1833) identified as Presbyterian, he viewed Silliman's religious interpretation of earth history as invalid. In 1832 he was brought before the college's Board of Trust in a trial that was held in the chamber of the state House of Representatives. The primary charge was leading students away from the religious traditions of their families. Cooper argued that his trial should be open to the public and that it was an example of religious persecution. The Board of Trust agreed on an open trial which was described in newspapers. The trial proved hard to arrange. Once, Cooper's main clerical accuser missed a planned session. Several other proposed trial dates were changed for lack of a quorum of Board members. Finally in December 1832 a trial was held. Before the trial, newspapers of the region published negative statements about Cooper that were not made under oath. The trial required sworn testimony and proof. His students swore that Cooper always told students to follow the religion of their parents. He was acquitted. Figure 3 shows Cooper on the South Carolina campus at about this time.

After the trial Cooper, still argumentative in his seventies, published a 64-page "letter" to Silliman in which he proved (to his own satisfaction at least) that the Pentateuch is no authority for the history of the planet (Figure 4). With his review of biblical matters he included a seventeen page excerpt from the *Columbia Times and Gazette* for December 14, 1832. It described the trial. He got no satisfaction from Silliman who ignored him. In 1833 Cooper voluntarily resigned as president but requested to be continued as professor of chemistry and geology. In December 1834, after much public agitation, a new Investigative Committee composed of "eight of the most distinguished men of the State" was formed, apparently by the State Legislature (LaBorde, 1859, p. 161). This group resolved that (LaBorde, 1859, p. 161):

FIGURE 3. Cooper on South Carolina Campus



ON

THE CONNECTION BETWEEN

GEOLOGY

AND THE

PENTATEUCH:

IN A LETTER TO

PROFESSOR SILLIMAN,

FROM

THOMAS COOPER, M. D

TO WHICH IS ADDED THE

DEFENCE OF DR. COOPER

BEFORE THE TRUSTEES OF THE

SOUTH CAROLINA COLLEGE.

COLUMBIA:

PRINTED AT THE TIMES AND GAZETTE OFFICE

JAN. 1833

FIGURE 4. "Letter" to Silliman

"The President, Professors and Instructors of the College, be requested to resign for the purpose of having the vacancy (sic) filled by such persons as the Trustees may hereafter elect."

Two faculty members were temporarily retained. When Cooper resigned and was not reelected, the school awarded him an honorary Doctor of Laws in recognition of his many accomplishments. For an extended discussion of unpleasantries that occurred between the time of Cooper's appointment and his termination see LaBorde (1859, p. 131-161). South Carolina newspapers of the era are available on microfilm by interlibrary loan. Copies obtained by the present authors were illegible for many critical dates. LaBorde (1859), Malone (1926), and Kelley (1930) quote them, apparently based on better copies.

Cooper's situation in 1834 had at least one notable precedent. "In 1633 the Inquisition condemned Galileo for holding that the earth moves and that the Bible was not a scientific authority" (Finocchiaro, 2005, p. 1). This challenged an official, scriptural view that the earth was stationary and that the sun and planets revolving around it. Another charge was "answering scriptural objections … by elaborating personal interpretations of Scripture" (Finocchiaro, 2005, p. 8). "Galileo would be imprisoned indefinitely" (Finocchiaro, 2005, p. 12). He lost his freedom. Cooper lost his job. In these conflicts academic disciplines differed but the pattern was the same. Today some seek to use faith-based subjects such as creation science and intelligent design to replace or supplement science in the science classroom (Covaleskie, 2008; Sharpes and Peramus, 2006). It is the same conflict, but there are minor changes. Most now agree that the earth rotates on its axis and revolves around the sun.

HENRY DARWIN ROGERS AND HIS SYLLABUS: THE UNIVERSITY OF PENNSYLVANIA, 1835

Like Thomas Cooper, Henry Darwin Rogers (1808-1866: Figure 5) was not a college graduate. Born in Philadelphia, he was the son of Irish immigrants. The family moved several times until his physician-chemist

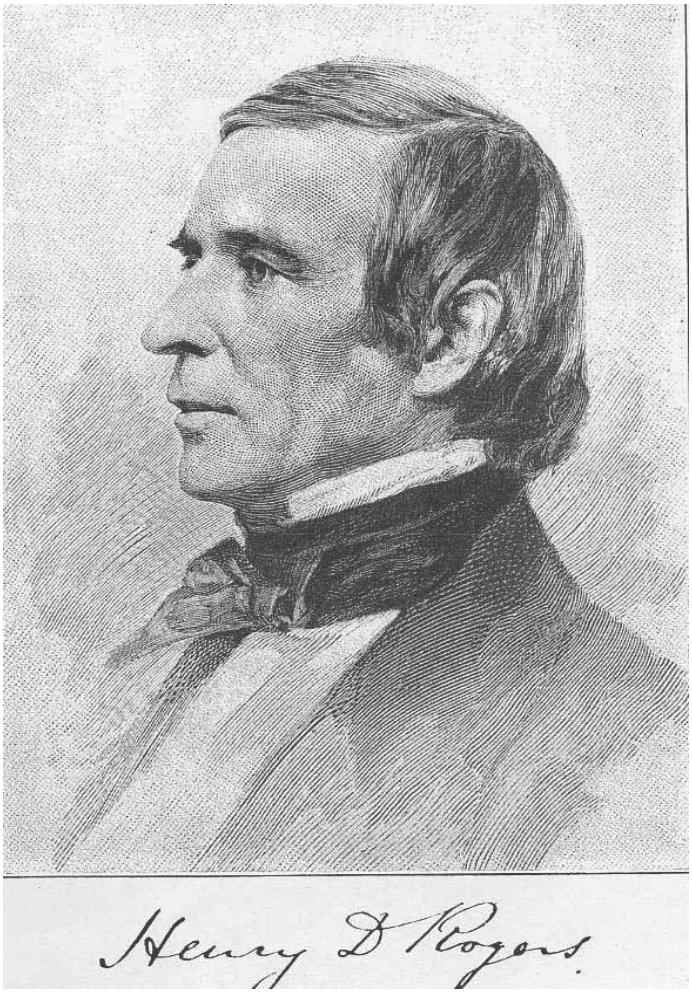


FIGURE 5. Henry Darwin Rogers

Table 5. ROGERS' SYLLABUS[1] - THE UNIVERSITY OF PENNSYLVANIA, 1835	
TOPIC	
Introduction	1%
Chemistry	6%
Minerals	22%
Rocks	71%
General Comments	14%
Unstratified Rocks [Igneous]	12%
Inferior Stratified Rocks [Metamorphic]	10%
Fossiliferous Stratified Rocks	
Grauwacke Group [Lower Paleozoic]	4%
Carboniferous Group [Included Devonian]	6%
Red Sandstone Group [Triassic]	4%
Oolitic Group [Jurassic]	3%
Wealdean Group [?Jurassic]	2%
Cretaceous Group	4%
Tertiary or Supercretaceous Group	10%
Recent Period	2%

[1]Spelling, headings, and subheadings follow Rogers (1835). Where clarification is needed it is given in brackets. Percentage assumption is the same as for Table 2.

father found stable employment on the faculty of William and Mary College. About 1825 Rogers attended William and Mary briefly and then began teaching in secondary schools. In 1829 he joined the faculty of Dickinson College in Carlisle, Pennsylvania. In earlier years this school was called Carlisle College. It was where Cooper taught from 1811 to 1815. At Dickinson, Rogers was primarily a teacher of chemistry. In 1832 he went to England where he began an involvement with geology. In 1833 Rogers returned to the United States, determined to make a career in geology. He traveled widely. Then, in 1834, began teaching geology at the University of Pennsylvania. He soon moved on to positions of greater distinction, directing geological surveys in New Jersey and in Pennsylvania, ending with a Regis Professorship at the University of Glasgow. When he wrote his syllabus he was beginning a new career at age 27. For biographical data see Gerstner (1999).

Rogers' 32-page "Guide" (Rogers, 1835) shows his teaching had a "hard rock" emphasis. About half is devoted to chemistry, mineralogy, and igneous and metamorphic rocks. Table 5, an outline of his course, shows the approximate percentage of text volume devoted to various themes. There is also a glossary that defines terms used in the guide and also introducing terms relating to topics that are not in the Guide. Like many early American geologists, Rogers used European names for major stratigraphic units, but he offered American localities. As a seasoned field geologist Rogers had observed the natural setting of the rocks he described. His syllabus is unique in that he does not directly discuss landscape although landforms are defined in his glossary. His was the first syllabus to avoid a complete dependence on Wernerian concepts of rock sequences. He discussed fossils, distinct episodes of volcanism, and environmental changes through time using many modern terms such as Eocene. These innovations follow Cooper's style. They were embedded in a lengthy discussion of a sequence of rocks that changed naturally in an orderly way through time. He even discussed the Drift without an explicit discussion of a supernatural cause.

JAMES RENWICK AND HIS SYLLABUS: COLUMBIA COLLEGE, 1838

James Renwick (1792-1863) was the child of affluent parents who moved from England to New York City when James was two. He graduated from Columbia College at 15. For the era, he was not an unusually young graduate (Mohsenin, 1983) but he was unusual because he was at the top of his class. He then went on a European tour. Columbia awarded him an A.M. in 1810. In 1812 the Professor of Physical Science grew ill and Columbia asked Renwick to temporarily assume the professor's duties. In 1814 he became a Major in the United States Army, specializing in topographic studies. By 1817, at age 25 Renwick was both a Trustee of the Columbia College and a colonel of engineers in the New York Militia. Then in 1820 he rejoined the Columbia faculty, teaching an array of courses in science and engineering. Renwick also found time for research. He had at least 13 geological publications (Hazen and Hazen, 1980, p. 314). Perhaps the most significant was a description of Ordovician strata at Trenton Falls, New York. Figure 6 shows Renwick as a mature professor at Columbia. Southall (1933) and Steele (1999) provide further biographical data.

His syllabus (Renwick, 1838) suggests that Renwick was a bit pedantic and that he bridged the gap between Bible-based and observation based views of earth history. His major Biblical consideration was topographic. He listed the heights of the highest mountains in the world that he assumed were inundated by the Noachian Deluge. His discussion of a pre-Deluge geological history follows the Cooper-Rogers pattern. It is embedded in a review of stratigraphy that uses post-Wernerian terms, such as Triassic. He also recognizes both biotic and environmental changes through time. Renwick divides Geology into three parts: physical geology; geognosy; and geogeny. Geognosy was rooted in lithology and modified Wernerian Stratigraphy. Geogeny dealt with observable

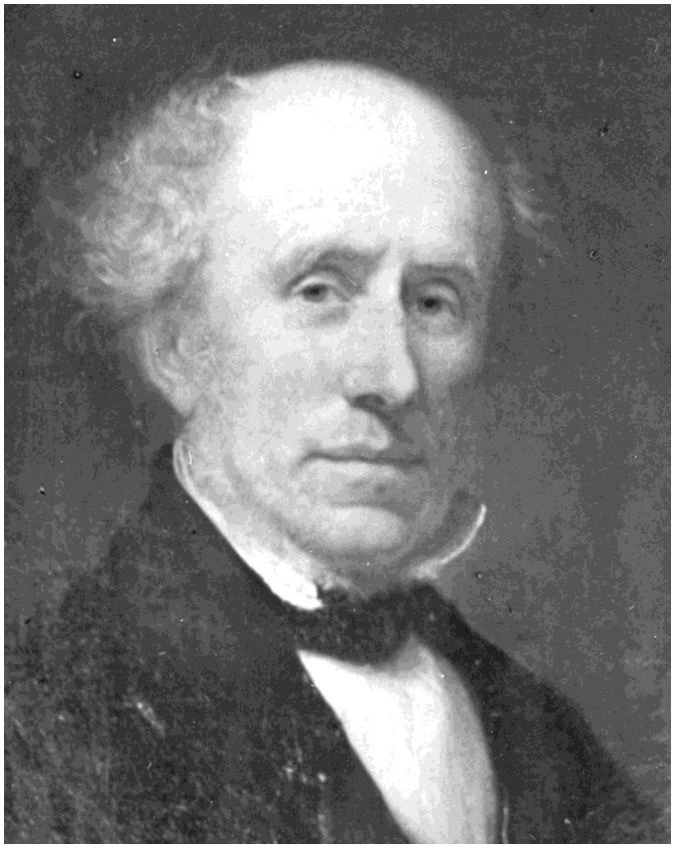


FIGURE 6. James Renwick

phenomena, such as volcanism and erosion. He noted biological response to past climate changes, used physics to speculate on the earth's interior, and was modern in most concepts. Table 6 is a synopsis of his syllabus. It is likely that Silliman approved of this course since a favorable review was published anonymously in Silliman's *American Journal of Science* (Anonymous, 1838).

SUMMARY

Six syllabi suggest that in the early days of geological education in America teachers introduced students to both physical and historical geology. Physical geology was essentially free of public controversy. Two radically different approaches to teaching earth history evolved and differences were discussed in the public press. One mode of instruction was rooted in observation; the other stressed Biblical revelation as well as observation. In 1817 and 1818, while he was at the University of Pennsylvania, and again in 1821, when he was at South Carolina College, Thomas Cooper published syllabi that stressed mineralogy, Wernerian stratigraphy, and physical geology. He ranked observation and the interpretation of observations as the only guide to unraveling earth history. In 1829 Benjamin Silliman, of Yale College, issued a syllabus with a different balance. While it introduced Wernerian stratigraphy, its great stresses were earth history and vulcanology. Silliman valued observation but ranked Biblical revelation as an excellent, or preeminent, guide to interpreting earth history.

Cooper's approach to deciphering planetary history did not please some South Carolina clerics. They agitated for his dismissal. In 1834, after years of turmoil, he and his entire college faculty were fired. Yet after 1834 a Cooper-like stress on observation remained the sole or primary guide to earth history in some schools. Through 1838 all known syllabi by new authors were primarily observation based, embedding details of earth history in a discussion of rock sequence. In a syllabus for classes at the University of Pennsylvania, published in 1835, Henry Darwin Rogers clearly stressed observation. In 1838 James Renwick of Columbia College bridged the Cooper-Silliman gap, emphasizing observation but compiling data on the height of mountains that would have been covered by the Flood. In 1829 the Flood was Silliman's most intensely biblical discussion, forming 22% of his lengthy syllabus. He stressed the Drift, a varied assortment of earth-surface deposits that he and others attributed to the Flood of Noah. After Agassiz published Alpine research in 1840 the scientific community gradually began to view at least some of the Drift as glacial debris. At about the same time, in an apparent coincidence, the publication pattern of American geology teachers changed. From 1817 to 1838 syllabi lengthened. By 1840 summaries of geological instruction in a single school such as Amherst College (Hitchcock, 1840) and North Carolina College (Mitchell, 1842) evolved into book-length texts, quite different from Cooper's initial effort.

In the history of geological education, early syllabi are a unique source of insight into life in the classroom, and the Cooper-clergy conflict is an especially notable event. Cooper's stress on the tangible led to his downfall, but his concepts proved more durable than his employment.

Table 6[1] RENWICK'S SYLLABUS - COLUMBIA COLLEGE, 1838

INTRODUCTION [includes general discussion of rocks and fossils]	13%	
PHYSICAL GEOGRAPHY [1/4 of this is the heights of mountains]	20%	
GEOGNOSY (Wernerian Stratigraphy)	47%	
Modern formations [organic, chemical, diluvial, alluvial]		13%
Volcanic rocks		5%
Superior formations [Tertiary]		5%
Supermedial formations [Mesozoic]		7%
Medial formations [Upper Paleozoic]		8%
Submedial formations [Lower Paleozoic		4%
Inferior and Unstratified formations (metamorphic-igneous)		5%
GEOGNEY [Observable agents of change: volcanism, erosion, etc.]	20%	

[1] Style and assumptions are as for Table 5. After Renwick (1838).

Similarly the Galileo-clergy tension inconvenienced Galileo. Observation based views of the evolution of life and the age of the planet are challenged by belief-based creation research and intelligent design. To evaluate such challenges history helps. Galileo prevailed. Cooper prevailed. Now it is "deja vu all over again" to steal a quote generally attributed to baseball's Yogi Berra.

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REFERENCES

Agassiz, L., 1840, Etudes sur les glaciers; ouvrage accompagne d'un atlas de 32 planches, Aux frais l'auteur, Neuchatel, 347 p. 32 plates.

Anonymous, 1838, [A review of] Outlines of geology…, American Journal of Science, v. 34, p. 183-185.

Anonymous, 1848, The late Prof. Vanuxem, American Journal of Science, n.s., v. 5, p. 445-446.

Bakewell, R., 1813, Introduction to geology, illustrative of the general structure of the earth; comprising the elements of the science, and an outline of the geology and mineralogy of England, London, J. Harding, 362 p.

Bakewell, R., 1829, An introduction to geology, comprising the elements of the science in its present advanced state and all the recent discoveries, with an outline of the geology of England and Wales, first American edition, edited by B. Silliman, New Haven, H. Howe, 400 p.

Bakewell, R., 1833, An introduction to geology (intended to convey a practical knowledge of the science and comprising the most important recent discoveries, with explanations of the facts and phenomena which serve to confirm or invalidate various geological theories), edited by B. Silliman, New Haven, H. Howe and Co., 479 p.

Bakewell, R., 1839, An introduction to geology intended to convey a practical knowledge of the science and comprising the most important recent discoveries, with explanations of the facts and phenomena which serve to confirm or invalidate various geological theories, edited by B. Silliman, New Haven, B. & W. Noyes., 596 p.

Browne, D. J., 1832, Geology comprising the elements of the science in its present advanced state, designed for the use of school and private learners, Boston, W. Hyde and Co., 108 p.

Carrell, W. D., 1968a, American college professors, 1750-1800, History of Education Quarterly, v. 8, p. 289-305.

Carrell, W. D., 1968b, Biographical list of American college professors to 1800, History of Education Quarterly, v. 8, p. 375-385.

Cleaveland, P., 1816, Elementary treatise on mineralogy and geology, being an introduction to the study of these sciences, and designed for the use of pupils, -- for persons attending lectures on these subjects,-- and as a companion for travelers in the United States of America, Boston, Cummings and Hilliard, 668 p.

Cohen, S., 1999, Cooper, Thomas, American National Biography, v. 5, p. 962-964.

Comstock, J. L., 1834, Outlines of geology, intended as a popular treatise on the most interesting parts of the science, together with an examination of the question whether the days of creation were indefinite periods …, Hartford, D. F. Robinson and Co., 336 p.

Comstock, J. L., 1836, Outline of geology…, 2nd edition, New York, D. F. Robinson and Co., 372 p.

Cooper, T., 1817, Introductory lecture on mineralogy, Port Folio, ser. 5, v. 4, p. 482-498.

Cooper, T., 1818, Syllabus of the lectures of Thomas Cooper, Esq., M.D. as professor of geology and mineralogy in the University of Pennsylvania, Port Folio, ser. 5, v. 6, p. 117-120.

Cooper, T., 1821, Syllabus of a course of lectures on the elements of geological mineralogy, Columbia SC, D. Faust, 8 p.

Cooper, T., 1833, On the connection between geology and the Pentateuch in a letter to Professor Silliman… to which is added the defense of Dr. Cooper before the trustees of the South Carolina College, Boston, J. Hall, 69 + 17 p.

Corgan, J. X., 1987, American geological education in the eighteenth century, Journal of Geological Education, v. 35, 184-192.

Corgan, J. X., and Stearns, R. G., 2008, Rise and fall of geology in nineteenth century American secondary schools: History and textbook reviews, Journal of Geoscience Education, v. 56, p. 33-54.

Covaleskie, J. F., 2008, Three why's: Religion and science in school, Educational Studies, v. 43, p. 7-16.

Cremin, L. A., 1970, American education: the colonial experience, 1607-1783, New York, Harper & Row, 688 p.

Cremin, L. A., 1980, American education, the national experience, New York, Harper & Row, 607 p.

Downing, W. C., 1999, Dwight, Timothy, American National Biography, v. 7, p. 192-195.

Finocchiaro, M. A, 2005, Retrying Galileo, 1633-1992, Berkeley, University of California Press, 485 p.

Fulton, J. F., and Thompson, E. H., 1947, Benjamin Silliman, 1779 -1864, pathfinder in American science, New York, Henry Schuman, 294 p.

Gerstner, P., 1999, Rogers, Henry Darwin, American National Biography, v. 18, p. 758-759.

Greene, J. C., 1979, Protestantism, science, and American enterprise: Benjamin Silliman's moral universe, pp. 11-27 *In* Wilson, L. G., Editor, Benjamin Silliman and his circle: Studies of the influence of Benjamin Silliman on science in America…, New York, Science History Publications, 228 p.

Greene, J. C., and Burke, J. G., 1978, The science of minerals in the age of Jefferson, Transactions of the American Philosophical Society, v. 68, pt. 4, 113 p.

Hall, T. L., 2003, American religious leaders, New York, NY, Facts on File, 430 p.

Hazen, R. M., and Hazen, M. H., 1980, American geological literature, 1669 to 1850, Stroudsburg, PA, Dowden, Hutchinson & Ross, 431p.

Hitchcock, E., 1840, Elementary geology, Amherst, J. S. and C. Adams, 329 p.

Hitchcock, E., 1841, Final report on the geology of Massachusetts …, Northampton, J. H. Butler, 831 p.

Kelley, M, 1930, Additional chapters on Thomas Cooper, University of Maine Studies, ser. 2, v. 15, 92 p.

LaBorde, M., 1859, History of the South Carolina College from the incorporation December 19, 1801, to Nov. 25, 1857, including sketches of its Presidents and Professors, Columbia S.C., Peter B. Glass, 463 p.

Malone, D., 1926, The public life of Thomas Cooper, 1783-1839, New Haven, Yale University Press, 432 p.

Mather, W. W., 1833, Elements of geology for the use of schools and academies, Norwich, W. Lester, Jr., 139 p.

Mather, W. W., 1838, Elements of geology for the use of schools, New York, American Common School Union, 286 p.

Millbrooke, A., 1982, South Carolina Geological surveys of the

nineteenth century, p. 26-38 *In* Corgan, J. X., editor, The geological sciences in the antebellum south, University of Alabama Press, 195 p.
Mitchell, E., 1842, Elements of geology, with an outline of the geology of North Carolina; for the use of students at the University, Yale: no publisher, 141 p.
Mohsenin, I. C., 1983, Notes on age structure of college students, History of Education Quarterly, v. 23, 491-498.
Morgan, E. J., 1999, Stiles, Ezra, American National Biography, v. 20, p. 771-772.
Morison, S. E., 1936, The founding of Harvard College, Cambridge, Harvard University Press, 472 p.
Naylor, N. A., 1984, Holding high the standard: The influence of the American Education Society in ante-bellum education, History of Education Quarterly, v. 24, p. 479-497.
Phillips, W., 1816, An outline of mineralogy and geology, intended for the use of those who may desire to become aquainted (sic) with the elements of those sciences; especially of young person, New York, Collins and Co., 246 p.
Renwick, J., 1838, Outlines of geology, prepared for the use of the junior class at Columbia College, Henry Ludwig, New York, 96 p.
Reynolds, K. C., 1999, Josiah Meigs, American National Biography, v. 15, p. 254-256.
Rogers, E. S., editor, 1896, The life and letters of William Barton Rogers, ed. by his wife, with the assistance of William T. Sedgwick, 2 v., Houghton, Mifflin and company, New York, v. 1, 427 p., v. 2, 451 p.
Rogers, H. D., 1835, A guide to a course of lectures on geology, delivered in the University of Pennsylvania, W.F. Gibbons, Philadelphia, 43 p.
Rudolph, F., 1977, Curriculum, a history of the American undergraduate course of study since 1636, San Francisco, Jossey-Bass, 362 p.
St. John, S., 1851, Elements of geology, intended for the use of students, Pentagon Press, Hudson Ohio, 334 p.
Sarjeant, W. A. S., 1980, Geologists and the history of geology, v. 3, The individual geologists L-Z, Arno Press, New York NY, p. 1500-2494.
Sharps, D. K., and Peramas, M. M., 2006, Accepting evolution or discarding science, Kappa Delta Pi Recorder, v. 42, p. 156-160.
Silliman, B., 1829, Outline of the course of geological lectures given in Yale College, New Haven, H. Howe and Co., 128 p.
Silliman, B., 1833, Consistency of the discoveries of modern geology with the sacred history of the creation and the deluge, New Haven, H. Howe and Co., 80 p.
Silliman, B., 1839, Suggestions relative to the philosophy of geology as deduced from the facts, and to the consistency of both the facts and the theory of this science with sacred history, New Haven, B. and W. Noyes, 119 p.
Smith, J. L., 1968, The teaching and practice of geology in South Carolina. South Carolina Geology Notes, v.12, no. 3, p. 39-66.
Southall, J. P. C., 1933, Renwick, James, Dictionary of American Biography, v. 15, p. 507-508.
Steele, B. D., 1999, Renwick, James, American National Biography, v. 18, p. 758-759.
Torrens, H. S., 1983, Arthur Aikin's mineralogical survey of Shropshire, 1796-1816 …, British Journal for the History of Science, v. 16, p. 111-153.
Torrens, H. S., 1995, Joseph Harrison Fryer (1777-1855): geologist and mining engineer …, P. 29-46 *In* Figuoiroa, S. F., and Lopes, M. M., Geological sciences in Latin America: Scientific relations and exchanges, Campinos, Brazil, variously paginated.
Warren, E., 1690, Geologia or a discourse concerning the earth before the deluge … also a new explication of the flood is attempted, London, R. Chriswell, 359 p. (Reprinted by Arno Press in 1978).
Warren, L., 1999, Silliman, Benjamin, American National Biography, v. 19, p. 933-934.
White, G. W., 1967, The first appearance in Ohio of the theory of continental glaciation, Ohio Journal of Science, v. 67, 210-217.